COAL MINING

JANUARY 1949 VOLUME XXVI, No. 1

ARKWRIGHT MINE MOUTH

(SEE STORY INSIDE)

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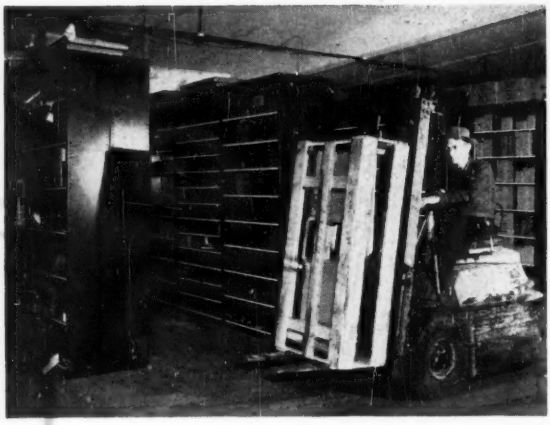

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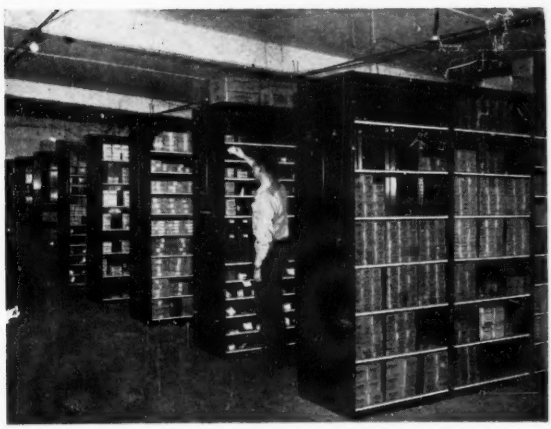

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Now available, thousands of genuine "Caterpillar" parts!

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COAL MINING

VOL. XXVI JANUARY, 1949 No. 1

Contents

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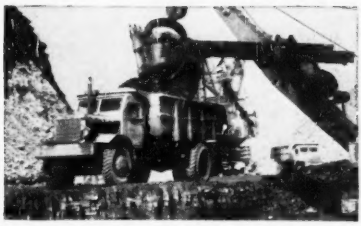
EUCLID PAY DIRT

Piles Up Profits for Owners

Bottom-Dump Euclid Coal Hauler being loaded with 40 tons of coal at an open pit mine of Cent. I Ohio Coal Company.



15-ton Rear-Dump Euclid Coal Hauler being loaded by a 7½ cu. yd. shovel at Georgetown Mine of Hanna Coal Co. in southern Ohio.

Model LD Rear-Dump Euclid dumps 30 tons of heavy overburden on a waste bank in the anthracite field. Owner: Dick Construction Co., Inc., of Hazelton, Pa.

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Ability of "Eucs" to stay on the job day after day under a wide range of operating conditions means more yards moved more profitably. Large capacity, speed on the haul road, ample power for steep grades and tough hauls... these are some of the Euclid features that get jobs done on time and at a profit.

Ask your Euclid distributor for a recommendation based on practical applications of Euclids on work similar to yours and for proof that there's more pay in every Euclid payload.

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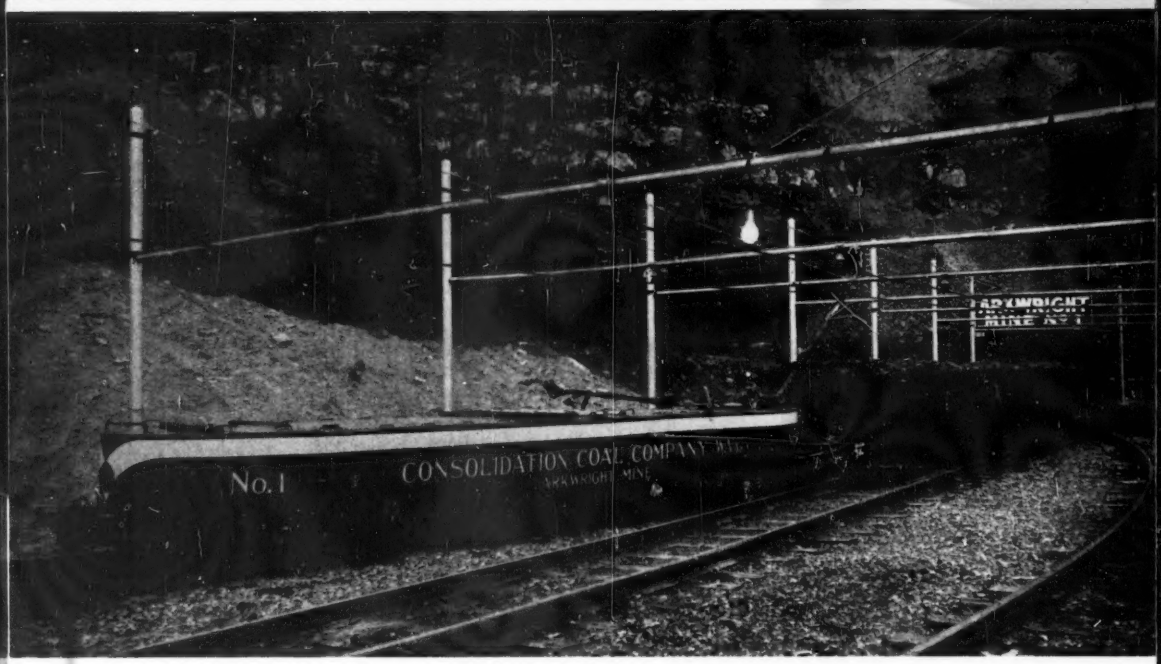

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With 8 Wheel Large Capacity Mine Cars

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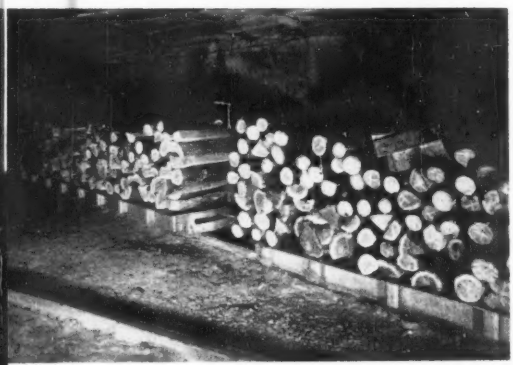

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Differential Man Trip Cars

for a safe, speedy, and comfortable ride

DIFFERENTIAL STEEL CAR CO.

FINDLAY, OHIO

Pioneer Builders of Haulage Equipment Since 1915

DO YOU KNOW

A dog's life for the dog-days: loaf all morning, take an afternoon siesta under the porch, have dinner at eight. This program has the joint recommendation of the American Veterinary Medical Association.

Further recommendations: Don't subject pets to strenuous exercise during the heat of the day. Don't expect animals to have hearty appetites in hot weather. See that they have clean, fresh water at all times. Give them, for their one daily meal, a ration with adequate amounts of animal protein, vitamins and minerals, including salt.

* * *

A used handkerchief can unleash a bombardment of 136,000 germ particles, according to a group of British scientists. Even more alarming was the discovery that common aerial disinfectants do not kill these germs.

* * *

War can be avoided and peace maintained by using the methods and knowledge of science. That is the belief of those who have been working on the problem.

"War is not born in men; it is built into men." Two thousand American psychologists in 1945 agreed that "no race, nation or social group is inevitably warlike."

An international group of social scientists summoned this year by UNESCO put it this way:

"There is no evidence to indicate that wars are necessary and inevitable consequences of 'human nature' as such. The problem of peace is the problem of keeping group and national tensions and aggressions within manageable proportions and of directing them to ends that are at the same time personally and socially constructive so that man will no longer seek to exploit man."

Scientists in arguing the usefulness of science in maintaining the peace are not suggesting that they should take over the day-by-day international relations job from the diplomats or that they should replace the military commanders. They do believe that they can and do help both the diplomats and the miltary in very practical ways so far as they are allowed.

Science and technology constitute the one field of human endeavor that is most truly international. They provide bridges between peoples, nations and ideologies that art, music, religion and business cannot furnish.

* * *

Two American gas turbine engines are now to be used in this country in conducting two notable experiments in the coal-burning field. The first is in connection with the use of pulverized coal as a fuel for gas turbine locomotives. The second is in the use of gases for fuel which are obtained by burning underground thin layers of coal just as they occur in nature. The gas turbine engine, now becoming more popular in America and other countries because of its efficiency, is similar to the steam turbine but utilizes gases of combustion under high pressure against the vanes of the shaft of the engine to cause its rotation. High-pressure steam is used in the steam turbine. One great advantage of the gas turbine is that it re-in locomotives.

HERE AND THERE IN THE COAL INDUSTRY

The President of the University of Kentucky has captioned his annual report to the Board of Trustees: "1948—The Great Year." In a section of the report dealing with the College of Engineering, a paragraph referring to scholarships says:

"Along with the Princess Elkhorn Coal Company's annual two four-year scholarships, the Ashland Oil and Refining Company Scholarship, the Harry E. Bullock, Jr. Award, and the Inland Steel Company scholarships, there was established during the past year an Annual Graduate Fellowship Fund of $2500 in Mining Engineering by the Consolidation Coal Company (Ky.) and two four-year scholarships each year for students in Mining Engineering by the Harlan County Mining Institute."

At the Nineteenth Annual Meeting of the Illinois Coal Operators Association, held in Chicago on December 16, the following were elected as members of the Executive Board: J. Roy Browning, D. W. Buchanan, D. H. Devonald, Geo. B. Harrington, Hubert E. Howard, E. R. Keeler, T. C. Mullins, T. J. Thomas, A. H. Truax, and Wm. P. Young. Officers of the Association for the coming year are: Geo. F. Campbell, President; J. Roy Browning, Vice President and Labor Commissioner; Fred S. Wilkey, Secretary; Thurlow G. Essington, General Counsel, and C. W. Peterson, Treasurer.

Mr. B. W. Whitfield, Sr., eighty-six years of age, passed away at Harlan, Kentucky.

He developed the Clover Fork Coal Mine, the Harlan Collieries Company, the Bell Coal Company and the Kentucky Jellico Coal Company. Mr. Whitfield was very influential in organizing the Harlan County Coal Operators Association and served as its Vice President for a number of years. He worked diligently in the establishment of Appalachian Coals, Incorporated.

Harry W. Payne of McComas, W. Va., formerly General Superintendent of the American Coal Company of Allegany County, has been elected General Manager, succeeding Henry F. Warden, now President.

Cheaper gasoline and fuel oil from coal is promised by improved processes under development at the U. S. Bureau of Mines experimental and research laboratories in Bruceton, near here.

In these laboratories, a basically new approach to the problem of synthetic liquid fuel production by direct hydrogeneration of coal is under investigation, the American Chemical Society was told by Dr. Henry H. Storch, chief of research at the institution. The method, he said, is a departure from the conventional Bergius process used by the Germans.

In this German process, coal dust is mixed with oil to form a paste. This is then treated with hot hydrogen under a pressure of more than 2,000 pounds per square inch. In the new process, Bureau chemists are trying to achieve better results by using moderate pressures and relatively high temperatures. Under these conditions considerable coal is turned to coke, but the coke can be recovered and used to furnish heat for the process.

In the new developments, relatively inexpensive water gas may replace the expensive hydrogen. The cost of compressed hydrogen constitutes about 50% of the total cost of liquid fuels prepared by hydrogenation of coal, he stated. Water gas, made by passing steam over white-hot coke, is the common manufactured gas used in many cities where natural gas is not available.

Laboratory experiments have disclosed that under appropriate operating conditions it is possible to replace pure hydrogen with the water gas, which is itself a mixture of hydrogen and carbon monoxide. Similarly, it is also possible to substitute for pure hydrogen the light, gaseous by-products of the hygrogenation process. Coal itself contains some available hydrogen which can be exploited by converting the coal to coke.

An entirely different process is also under study. In this the coal is dissolved before being treated with hydrogen. Research is now directed at determining the best solvent, and also at discovering suitable catalysts to speed the hydrogenation action under these conditions. This process is carried out at relatively low temperatures and pressures.

Main Mine Office Building, shaft and shaft head house at the Arkwright Mine. In this building are the offices of the Superintendent, Foremen, Chief Clerk and his Secretary, Engineering and Drafting Department, Lamp House. Locker Room, Showers, Replacement Parts Storage and Hospital.

CHRISTOPHER COAL COMPANY'S ARKWRIGHT MINE

All our lives and according to history of the preceding century, the world has been in a state of continuous change. In North America a few immigrants, several hundred years ago, have grown to more than 170 million inhabitants. Forests and prairies have been made into agricultural and industrial developments. A transition from human and animal power to electric power has taken place. We have gone from handicraft and agrarian culture to complex industrialization. As industrialization increases, however, complex problems arise, problems which man has never encountered before.

In order to better enable us to cope with such problems the College of Engineering, in conjunction with the Institute of Medicine of the College of Medicine, New York University is pioneering an effort in cross-fertilization of ideas from many scientific fields which are concerned with the general problems of inter-

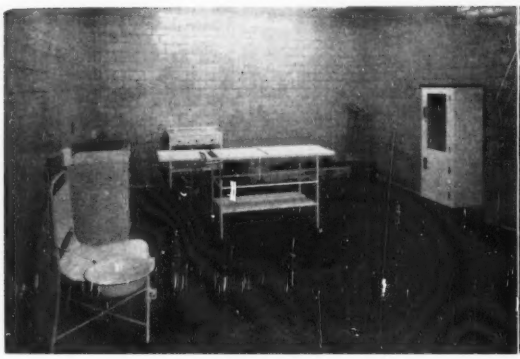
(*Continued on page* 16)

Office of the Chief Clerk and his Secretary.

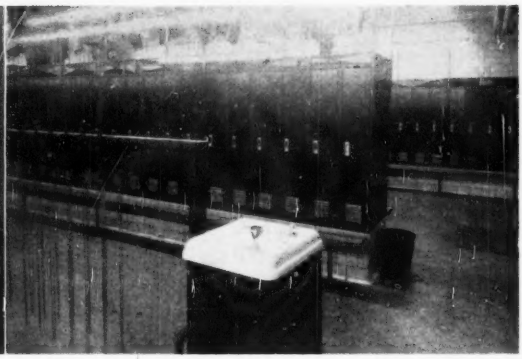
Office of the Superintendent.

Office of the Mine Foremen.

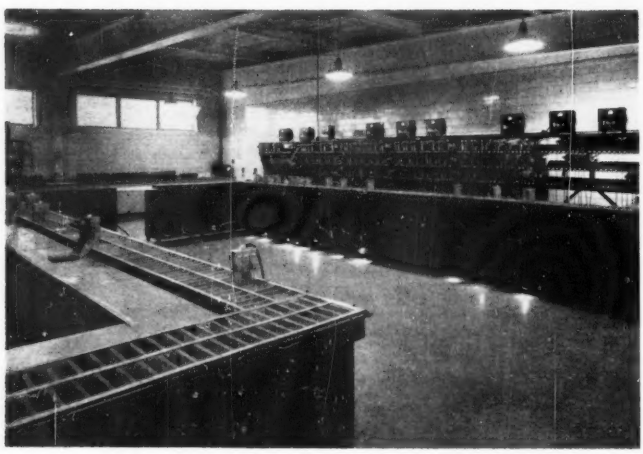
Drafting room in the main office building.



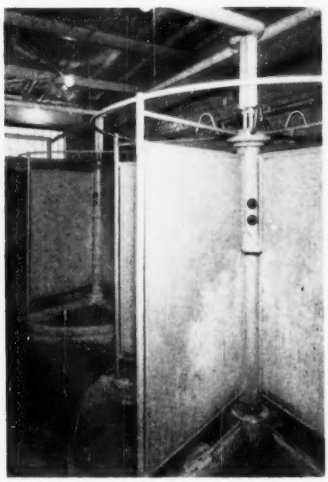
The Mine Emergency Hospital.



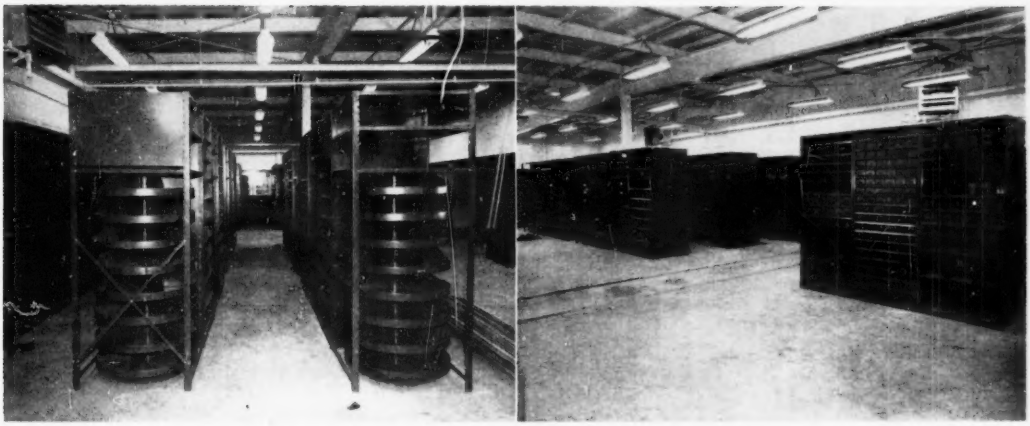
Worker clothes locker room. Note ventilating duct on lockers. Exhaust fan draws air through the locker to the outside. There is no odor in the room. Heat comes through the concrete floor.



The miners lamp house that surpasses any ever built.

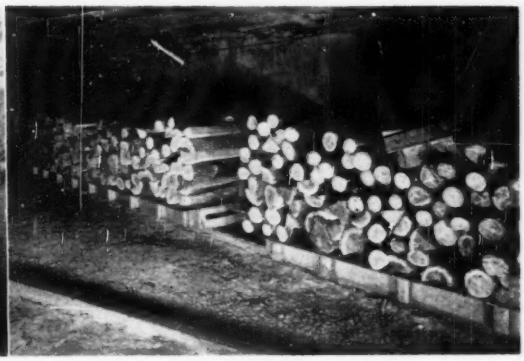


Shower room in the workers quarters.

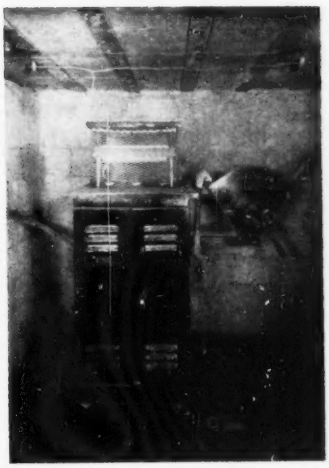


Two views of storage bins in the replacement parts storage room.

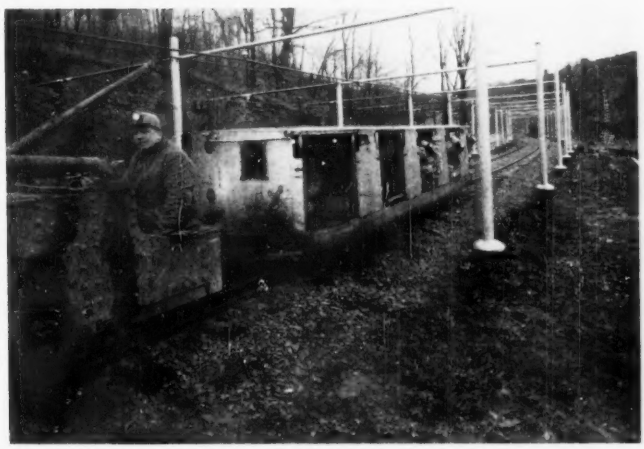
Steel "H" beams are used to arch timber bad spots in roof on main haulroad.



Flat cars are used to haul timber and other mine supplies.



One of the Automatic Reclosing Circuit Breakers that are used through the mine.



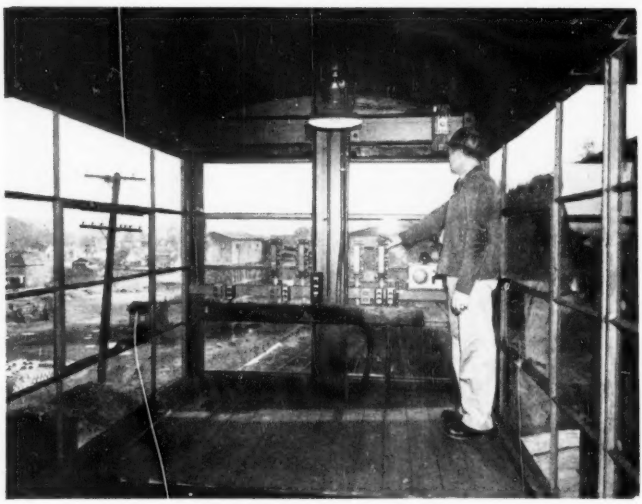
Steel mantrip cars are used for transporting workers to the face.

Some of the improved outside track

Loaded 8-wheel-all steel mine cars at the end of their trip to the cleaning plant. Part of the new 60-inch refuse belt conveyor can be seen in the background.

Concrete work on main haulage road running through hill to the cleaning plant.

Close up of the Mine Mouth, showing the traffic signal blocks that are being installed.



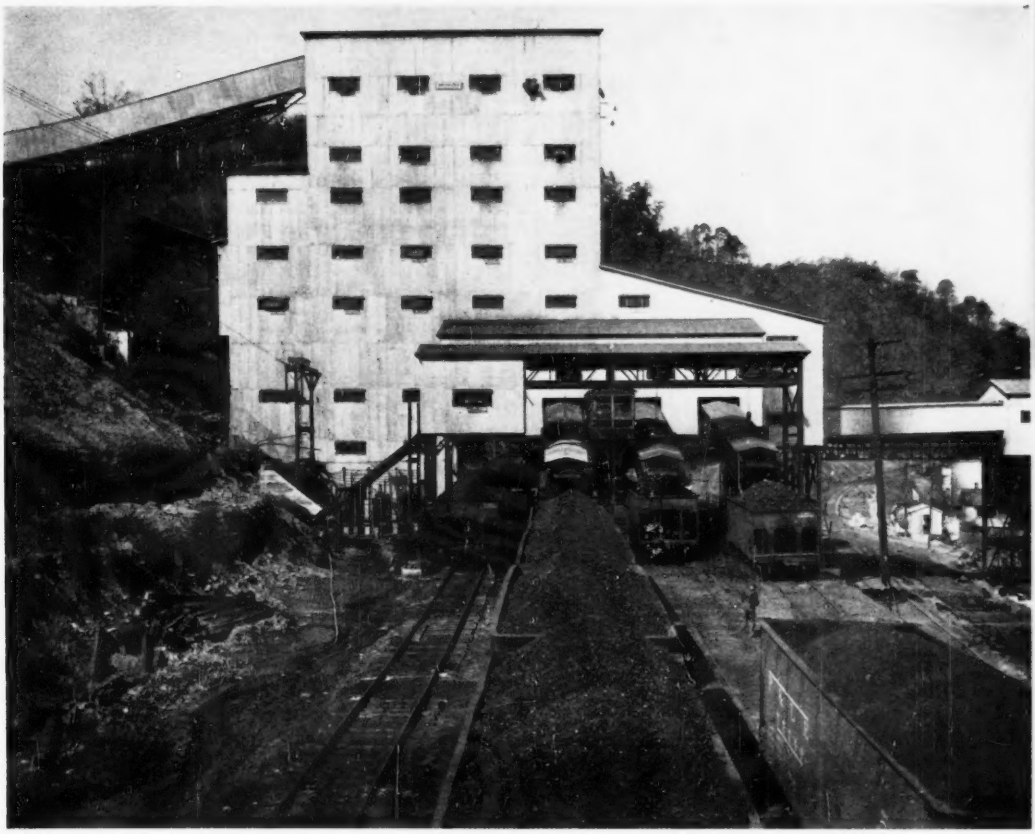
Control tower at the cleaning plant.

(*Continued from page* 13)

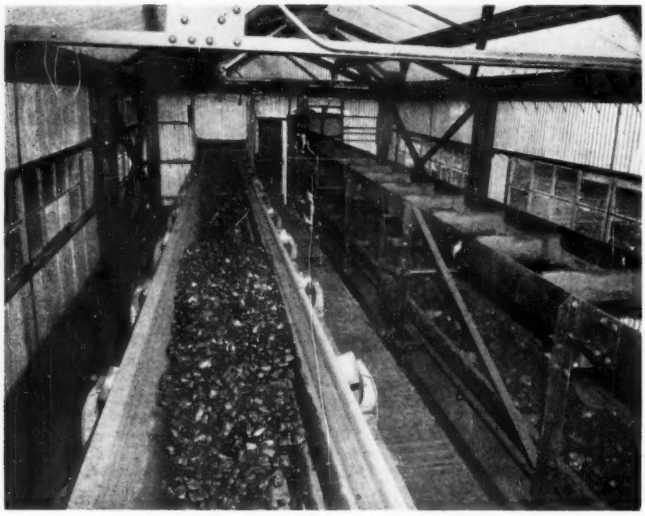
actions of men and machines. This effort is being called Human Engineering. Experimental techniques and data of engineering, the biological, medical, the psychological and certain other social sciences, notably anthropological, all of which are concerned with conditions under which man works and the factors associated with optimal performance of machines are being drawn upon heavily.

Sessions of the Human Engineering Seminar have attracted representatives from virtually all of the professions whose mutual interests find expression in this work. Some major problems of human engineering have begun to emerge and to clarify themselves. There is a growing acceptance among participants of the need to fashion practical working procedures for team approach to the resolution of pressing research prob-

Overall view of the cleaning plant and belt conveyor to the River. The coal testing laboratory is being built beyond the loaded railroad cars.



Side view of cleaning plant, showing railroad car loading booms.



Some of the conveyors in the cleaning plant.

lems from many sciences which find concrete expression in this field.

Among papers presented before the Seminar was on "The Present Status of Fatigue." There was an effort to understand problems of fatigue within the context of motivation as a psychological process. "An Over-All View of personality for Human Engineering" sought to advance the motive notion that in human engineering research, man has for too long been considered a machine or machinelike and that it is time to concern ourselves with attitudes, motivations and other personality characteristics and processes of men in relation to design and operation of machines.

Other papers "The Present Status of Principles of Motion Economy," and "Anthropometric Data in Design and Operation of Machines and Equipment" highlight interests of members of the Seminar.

Sometime in the future we will have more concrete information about reactions of men to machines. In the meantime, the Christopher Coal Company, Subsidiary, Pittsburgh Consolidation Coal Company, (W. Va.), W. L. Doolittle, President, C. R. Nailer, Vice President, and Frank Brooks, Superintendent, is applying its present best knowledge of Human Engineering to the coal mining industry at its Arkwright Mine at Granville, West Virginia.

From the standpoint of mining coal, the top office building and the shaft head house of this mine are so far ahead of anything in the industry that they are simply out of this world.

The main entrance and supplies shaft of the Arkwright mine is located 6 miles from the head house of the preparation plant on the Monongahela River. Coal is being produced from the Pittsburgh seam which averages 6½ feet thick at that location. Production Equipment consists of cutting, drilling, loading machines and shuttle cars of the latest type.

Considerable grading has recently been done on the main haul roads. Heavy (85 pound) track has been laid on ballasted roadbed. Gunniting has been started to stop spalling. Bad roof had been taken down and the areas are arched with welded steel H beams. An electrical signalling system is being installed.

The transportation equipment consists of large 8 wheel all-steel mine cars and 26 ton streamlined locomotives, built by the Differential Steel Car Company. Timbers and supplies are hauled in flat bottom cars. Men are transported to working places in Differential all steel mantrip cars. Main line locomotives are being equipped with Farmco Trolley Phones. A modern underground machine shop is being built. At the head house loaded mine cars are dumped by a Link-Belt rotary dump and the raw coal goes to a 2,700 ton concrete silo type storage bin. The raw coal is then fed from the bin into a Fairmont Machinery Company built Chance Sand Flotation Cone for cleaning.

A new folder entitled "Hot News for Cold Engines' has been released by the distributors of California Oil Company Products for their "Chevron Starting Fluid.' The folder describes how starting fluid gives quick starts to Deisel and gasoline power units under cold weather conditions.

This new folder is available from Gordon Lubricating Company.

* * *

New literature covering 6 ton MH 88 locomotive resistors, Choke Resistances, W-180 Bond Welders and BW-200 Bond Welders has just been released by the Electric Manufacturing Company, Inc., West 16th and Virginia Ave., Huntington, W. Va.

Photos Courtesy Hewitt Rubber Co. of Pittsburgh

Belt Conveyors in two West Virginia Mines.

Conveyor Belt Fires In Bituminous Coal Mines

By JOHN H. HANSFORD

Director, Mine Rescue and Safety
West Virginia Department of Mines

This paper is prepared solely from experience in connection with belt fires within the State of West Virginia and no attempt is being made to dictate methods and procedures to be used by operating companies or enforcing agencies in other parts of the country. It is hoped, however, that when designing and maintaining belt-operated mines you will be able to profit from our experiences, both good and bad.

In the past year and a half, West Virginia has suffered eight fires in belt operated mines. Five of these fires had their origin in connection with the operation of the conveyor unit as a whole, or in the electrical circuits of the belt driving machinery, and three were caused by friction on the belt itself. The friction, in each case, was the result of a stuck roller or a slipping drive pulley.

Let us first consider the fires occuring as the result of cable failure or insulation break-down. In every instance, from investigation, it appeared that the circuit, wherein the failure occurred, was not properly protected against overload or, if it was properly protected from an installation standpoint, the protective elements were made inactive by improper maintenance. Consequently, when the circuit was subjected to an overload the cables and drive motors "just took it," so to speak, until the weakest point finally gave way.

A fire resulting from an overloaded conductor kindles rapidly because, by the time of the ultimate failure, the windings of the motors and the copper of the cables are preheated to a high temperature. The surrounding debris, and there usually is some coal dust and oil drippings, is just waiting for the flame.

I shall briefly describe the findings in connection with the belt fires resulting from electrical sources:

Case I: The fire originated between shifts and was discovered by the fire boss. The location was deep in the mine near a partially pillared area where gas may have accumulated. The belt was cut but, due to the intensity of the fire and the system of mining, several days and nights of dangerous work were performed without bettering the condition and, had not a major fall occurred on what remained of the burning belt, it is doubtful if the fire could have been contained and stopped from spreading to the old works with the consequent sealing of a large area and a major loss of machinery. During the fire, two men barely escaped with their lives. A short circuit in the power cables alongside the belt was the fire's origin but the cause of the short circuit was definitely determined.

Case II: The fire originated at night, in a structure outside the mine which housed the driving machinery for the main belt. The fire spread to the belt and continued inside the mine for approximately two hundred feet, until extinguished. The exact point of the ignition was not determined, due to excessive damage. However, after investigation the conclusion was that the fires origin was electrical and due to an overload. Material in the structure was ignited with a major fire as the result.

Case III: The fire originated at a driving head inside the mine and was the result of cable failure. The cable was underneath gob and coal at the time of the failure and this material was ignited, the flame spreading to the belt. There appeared no reason for the cable failure, other than overload or overload plus a bad splice. The fire was contained and extinguished in twelve hours with a minimum of loss.

Case IV: In this instance, an accumulation of dust and coal at the tail piece fouled the belt and tail pulley and caused such an overload on the drive motor that an insulation failure, due to the excessive overload, finally occurred. The resulting fire spread to the belt but was luckily discovered before a large area was involved and was contained and extinguished within fourteen hours.

Case V: The fire originated at a face junction box and along a power

cable supplying the conveyor unit and was the result of a short circuit in the junction box. Overload protection, a 1000 Amp. circuit breaker which obviously was set too high, was provided outby the junction box but was not effective. Part of the circuit in by the breaker was No. 00 insulated cable and it was connected to approximately 350 feet of No. 4—3 conductor cable; the junction box being at the end of the No. 4—3 conductor.

When the short circuit occurred and did not burn free, the entire length of the No. 4 cable became red hot and set fire to everything it touched which was inflammable. Presumably, the greater current capacity of the No. 00 cable did not allow it to heat sufficiently to kindle or the fire would have immediately involved the entire length of the extension, some 1300 or more feet. The fire occurred on an off-shift and was discovered by a fire boss only after extensive damage to a secondary belt servicing three units in the immediate vicinity. The fire was contained on the second day, but several more days were required to extinguish it and load out the debris.

You will note that, while the ignitions in these foregoing instances were of an electrical origin, they probably could have been prevented through proper overload protection maintained in a workable manner. The fact that poor housekeeping, in the way of allowing combustible material to remain in close proximity to the motors, cables and belts, contributed to the generally unsatisfactory manner in which the units were maintained, it could not be described as a cause. It was, however, a ready and able assistant once, the ignition occurred. It is obvious that, in at least one instance, there was gross neglect in not maintaining the conveyor and conveyor structure free of accumulations of coal dust.

We will now consider the belt fires which were the result of mechanical difficulties. In the first instance, we have a belt head fire as the result of the drive pulley slipping. There were two possible causes; one that the belt was just carrying too much load and the other the failure to properly tighten the belt after splicing to insure proper friction. The second assumption appears most logical as it was found that, at the end of the preceding shift, the belt had been spliced but had not been run under normal load, due to the ending of the shift. The fire occurred at about the time the second or oncoming shift began to function at its maximum efficiency, which gave credit to the assumption that, after the splice was made, the belt takeups were not positioned to insure the proper friction necessary to propel the usual load.

Belts in this mine had been spliced on other occasions and had been closely observed for slippage and tracking while being "run in." The fact that there was a shift change at the time the belt was spliced should not have changed this procedure. Had the night shift been instructed to look out for the usual difficulties which are always encountered when a belt splice is made, they would have observed the belt slipping and avoided the fire.

The cause, however, of the belt stoppage was entirely different and was the result of negligence. Coal around the tail pulley finally packed to such an extent that the belt and pulley could not turn.

The third instance is essentially the same as the second. After starting the belt, the employees later discovered the belt on fire at the driving head, due to drive slippage. The belt had fouled as the result of improper maintenance.

Of the eight fires, of which I have given you a short description, seven varied from serious to critical situations, with one near catastrophe. In all but one of the fires, men had to be removed from the mines under varying conditions, none of which were favorable. Crawling can never be called a favorable way to escape an impending disaster inside a mine, even if you should have a good crawlway, and very few belt operations maintain track for supplying or travel.

In all instances, there was damage to the belt installation and mine generally and, in every instance, the mine was idle from two days to several weeks, resulting in great expense.

The methods of fighting these fires followed one general pattern which, in turn was necessitated by the physical condition of the area and the material at hand. This method was, if possible, to get on top of the fire with rock dust or rock dust plus water, if the latter was available, and always the rock dust had to be transported the "hard way" through areas where a man could not walk.

In view of the fact that the belts are very flammable and the trough, with its rollers full of grease, can be compared to an oversized blow torch if the ventilating current is strong, it is readily seen that time is the all important factor once an ignition occurs. In most of these fires, the time element was realized and while the fire fighting material, that is the rock dust, was available in only small amounts, it was utilized to the fullest extent and did slow down the fires until help arrived. The West Virginia Department of Mines has long advocated that supplies of rock dust be stored at strategic places inside the mines and, at some of these fires, the precaution paid off.

It is worthy of note that, in all but one instance, the fires occurred in the vicinity of the belt heads or spill in points. It is imperative then that these vulnerable spots be adequately protected at all times. Ordinarily, in large belt installations, a maintenance man or two patrols the belts during the day shift and another checks around, so to speak, during the night but they can do little, other than sound an alarm, if they are a quarter of a mile away when a fire starts. Operators should install automatic fire controls at the drive points and spill ins that would be actuated by heat. You have fuse links that shut your sub-station doors in case of a fire. Why not a similar arrangement to drop rock dust barriers or open sprinklers in and around the belt? Better overload protection, the assurance that the existing protection is in proper working order.

Attention should be called to the unusual incidents in connection with the fires caused by the short circuit in the junction box, as probably nothing exactly like this had been experienced prior to that time. The cable was not insulated with an insulation of special fire-resistant characteristics, the cable being of standard manufacture. The cable, except where coiled, was suspended on the mine timbers by the means of insulators which became so hot, as a result of the short circuit, that the insulators, with probably some assistance from the burning insulation, set fire to many of the posts from which it was suspended and, wherever the cable crossed the belt line, the belt was thought to have been ignited by the fiery drippings. As a result of these unusual occurrences, several fires at various points were started simultaneously. Fortunately, this occurred along a secondary belt but imagine such a fire on your main belt.

In discussing these fires, I have used the word "contain." I have done it purposely, for a belt fire must be contained to be fought. You cannot overtake a belt fire if it has a start. Our most disastrous fire could not be

contained and was extinguished only after large falls, occuring as a result of the conflagration, actually stopped the fire from further travel and the area cooled sufficiently to allow the fighters to load out the debris.

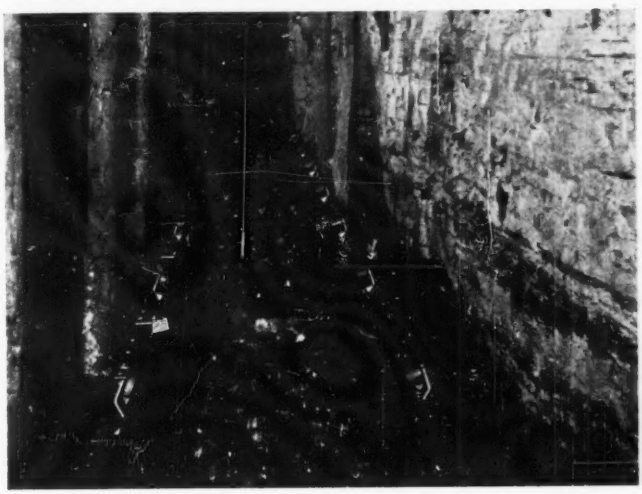
A belt fire burns rapidly in both directions from the source of ignition, once the fire really gets under way. A person approaching must travel the intake airway, whether under oxygen or not, as the heat and smoke prevents his approach on the return. He immediately cuts the belts and prevents the fires spread in the direction from which he has approached and starts fighting the fire, but what of the other end? Offhand, we will say "Let's get down the back air courses." But, can you always do this? I do not mean that remark solely in the light of poor air course maintenance and two and one-half to three foot coal.

Ventilation must be maintained while the fire is being fought until the men escape so you still have a return somewhere that you must enter if you get around the fire to contain it. Later you may change the air flow to better suit the conditions, but all this requires time and preparation.

As the result of unfortunate occurrences, such as have been enumerated, the West Virginia Department of Mines is giving serious consideration to the future in regard to the approval of the ventilating system of belt operated mines. Engineers submit many plans of operation but not always is the method of ventilation, especially in view of a possible catastrophe, given as much consideration as the arrangements for a smooth flow of coal.

If the haulage belts were installed in a dead entry, that is to say one with only sufficient ventilation for safe operation of the belt and the intakes and returns separated from this entry by incombustible stoppings, would not this be an ideal arrangement? Should a fire occur, it could then be contained immediately by entrance to the belt entry from an unaffected area and be fought from either end. Temporary seals could be placed within the hour to prevent the spread of the fire and assure ample time for escape.

Fires in any mine are bad but in mines operated solely by belts they are extremely hazardous, and we must not overlook any means of prevention, for when men are caught behind a fire, with no means of transportation other than the belt, the situation is at once critical.



Belt conveyor in bad roof area of a Pittsburgh seam mine South of Pittsburgh, Pennsylvania.

We now have installations whose failure may require over a mile of crawling. Imagine doing this under the best of conditions, much less under the probable necessity of crossing roof falls or water holes. Can these men be reasonably assured of ample time to escape under the present general mining plan, even though promptly notified and the ventilating current as manipulated as to assure fresh air travel for a considerable period? Belt fires are vicious and throw off great quantities of dense smoke and fumes and, as we know, travel fast. Pillars are usually thin and escape could be cut off. I would feel much better, when a fire did occur, if I knew my belts were already contained and I had only to throw up a quick stopping ahead of and behind the affected area.

Ignitions may not be entirely prevented but they can be held to a minimum by proper maintenance of the belt line itself and the utilization of properly maintained overload protection in the electrical circuits. When an ignition does occur, a catastrophe may be prevented by having your belts all ready to contain, should the self-acting rock dust barriers and sprinklers you have installed at strategic places fail you.

Mine Examination Questions and Answers

ELECTRICIAN'S EXAMINATION
BITUMINOUS DIVISION
Section 2 June 3, 1948

Q. 11. What hazards are created by the use of electricity in mines?

A. 11. (60 pts.)
1. Mine explosions
2. Mine fires
3. Electrocutions
4. Electrical shocks
5. Electrical burns
6. Injury to the eyes from electric flashes
7. Premature firing of explosives by stray currents

Q. 12. (a) What are the essential features to be noted in inspecting electrical installation and equipment?

(b) What action should the mine electrical inspector take if he found serious defects in electrical equipment and what reports shall he make after his inspection?

A. 12. (60 pts.) (a)

1. Competent person should be in charge of electrical equipment, fitted for the position by ability, training and experience. Not to be assigned to other duties; entire time should be spent in looking to safety of electrical installation.

2. A systematic inspection and record of electrical equipment. Inspections to be made according to law.

3. A map or plan should be kept of electrical system.

4. Instructions for resuscitation from electric shock should be posted, (especially in every generating, transforming, and motor room and at the entrance to the mine).

5. All employes (working in connection with electrical apparatus) should be familiar with and know how to carry out these instructions.

6. All persons should be properly instructed in their duties before being allowed to work with electrical equipment.

7. Electrical equipment should not be operated by any unauthorized person.

8. All metallic frames, casings and coverings of all stationary apparatus should be grounded, also metallic sheaths or coverings of cables.

9. Coal cutting machines should be kept in "permissible" flame and explosion proof conditions; thoroughly inspected at regular and frequent intervals.

10. Are the state laws and regulations being complied with insofar as using open type of equipment on intake air only; no trolley wire or feeder cables installed beyond the last cut-through, etc.

11. In inspecting enclosed type or permissible electrical equipment, are the covers of compartments in place and held down with a full set of bolts with lock washer.

12. Are the flanged surfaces clean and free from burrs so that the covers can be closed tightly.

13. All joints where rigid or flexible conduit leaves the various enclosures should be inspected as to tightness.

14. Is the trailing cable in a safe operating condition, especially insofar as splices made by the machine operator.

15. Is the machine as well as the trolley tap equipped with the proper fuses.

16. Are there any repairs that need immediate attention with regard to safety.

17. Are the frames of all stationary motors, transformer cases, enclosed metallic switches, metallic sheaths of cables, etc., effectively grounded.

18. All pipe lines paralleling a haulage road should be effectively bonded to the rails of such road at frequent intervals.

19. On all branch circuits where they leave the main circuit there shall be installed a suitable switch for disconnecting purposes.

20. The trolley wire and feeder cables on the haulage roads shall be rigidly installed, with safe clearance as regards both the mine timbers,

roof of the heading or mine equipment.

21. At all places where men must regularly pass under the trolley wire, same shall be effectively guarded.

(b) (20 pts.) He should order such equipment out of operation until such defects are corrected.

He shall report all defects found to the mine foreman, and shall make a written report of his inspection in a record book kept at the mine.

Q. 13. What are some of the advantages of alternating current.

A. 13. (30 pts.) Alternating current permits transmission at high voltages with little line loss and reduction to usable voltages at the point of consumption.

Q. 14. What is the effect upon motors from a drop in voltage?

A. 14 (40 pts.) Inefficient operation, abnormal heating, possible burnouts, and decreased speed.

Q. 15. Name the six fundamentals of first aid, in order of their importance.

A. 15. (40 pts.)

1. Artificial respiration
2. Control of bleeding
3. Shock
4. Open wounds and burns

5. Fractures and dislocations
6. Transportation

Q. 16. If the cost of D.C. energy is 2 cents per kilowatt hour, what is the charge on a motor operating at 40 amperes on 250 volts for 100 hours?

A. 16. (20 pts.)
40 x 250 x 100 equals 1,000 kilowatt hours.
1000
1000 x .02 equals $20.00

Q. 17. (a) Where should trolley wire be installed with respect to the rail?

(b) For what purpose is the trolley wire installed outside the rail?

(c) What are the requirements of the law relative to guarding trolley or other bare power wires?

A. 17 (a) (20 pts.) At least 6 inches outside the rail and only on the side of the tracks opposite the clearance side.

(b) (20 pts.) To reduce danger of contact with the locomotive operator, mobile equipment, and persons traveling on a haulageway.

(c) (30 pts.) At all landings and partings or other places where men are required to work or pass under trolley or other bare power wires, which are less than six and one half feet above the top of the rail, a suitable protection shall be provided. This protection shall consist of placing boards along the wire which boards shall not be more than five inches apart, nor less than two inches below the point of the wire; provided, that distance between boards on curves may exceed five inches but shall not exceed eight inches. This does not prohibit the use of other approved devices or methods furnishing equal or better protection. The guarding of trolley and other bare wires as described in the above rule should extend the entire distance of the openings or exposed areas.

Q. 18. (a) Name three hazards arising from the use of acetylene torches in mines.

(b) What precautions should be taken in the use of such torches.

A. 18 (a) (30 pts.) 1. Possibility of the emission of explosive gas into the mine atmosphere.

2. Possibility of fire.
3. Possibility of the cylinder becoming ruptured.

(b) (30 pts.) The use of acetylene torches should be confined to machine shops that are ventilated by a separate current of air which returns directly to the main return air current.

The cylinders should be equipped with metal caps fitted over their main valves while they are being handled or transported.

The cylinders should be transported only in insulated cars or in insulated boxes.

The burning mechanism should not be fitted to the storage cylinder until ready to use.

The following precautions against fires should be taken:

1. The machine to be repaired should be cleaned of oil and grease.
2. Adequate fire protection should be taken such as:

a. An ample supply of rock dust to be immediately available.

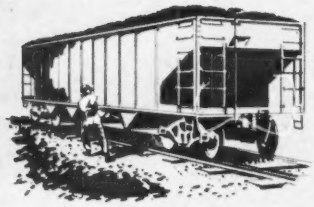
b. Fire extinguishers of proper type and ample capacity to be immediately available.

(To be continued)

DO YOU KNOW

An apple-scented German cousin of DDT, known as DFDT, proves to be a better killer of houseflies and certain other flying insects than DDT. At the same time DFDT is apparently less toxic to warm-blooded animals and fish. Dr. W. T. Sumerford of the U. S. Public Health Service told members of the American Chemical Society at a regional meeting.

The "F" in DFDT stands for fluorine, two atoms of which are substituted for chlorine atoms in the original DDT formula. Spelled out in full, the compound is di-fluoro-diphenyl-trichloro-ethane. It was much used in Germany during the war, but is only now being investigated in this country. Although it kills fewer insect species than DDT, it has quicker knockdown power against the ones it does affect.



For easy handling of coal in winter . . .

Preparation must include

FREEZE PROOFING

DUST PROOFING

CLEAN HANDLING

PERMANENT ODORLESS TREATMENT

BETTER STOKER FEED

LESS WINDAGE LOSS

with PERMATREAT Coal Spray

Unloading frozen coal from hopper cars by the use of fires, sledges and crow bars is a costly, time-consuming operation. Eliminate freezing by controlled application of Permatreat.

Permatreat makes coal easier-handling, more desirable. This means better satisfied users. Permatreat will not corrode stokers, mine cars or equipment at the tipple. Dust-proofs as it freeze-proofs.

If you are not treating at present, let Ashland help you get started. If you are treating, call Ashland on best procedure for proper application. No obligation.

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PERMATREAT
COAL SPRAY
seals in dust

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Ashland, Kentucky

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SPECIAL BARGAIN
3—Type A3G Goodman Duck bills.

COAL DRILLS
2—Jeffrey—250 v. DC.

COMPRESSORS—SPECIAL BARGAIN
7—240 cfm Westinghouse 3 cyl. vert. 150 lb. pres. dir. con to 50 HP AC Slip ring or DC Motors.

TRANSFORMERS
20—New 25 kva, 450 v. pri. 220/110 v. 1 ph. 60 cy. Allis-Chalmers.

MOTOR GENERATOR SETS
250 v. DC—Motors 220/440 or 2200 v. 3 ph. 60 cy.

No.	KW.	Make	Speed
1	150	West.	1800
1	135	G.E.	1200
1	100	West.	1600
2	100	Delco	1150
2	75	West.	720
1	60	Cr. Wh.	900
2	60	West.	490

D.C. Generators—250 v. D.C.

No	KW.	Make	Speed
1	250	West.	1200
1	175	G. E.	700
3 New	135	G. E.	1150
1	125	West.	560
1	125	Allis-Chal.	1150
1	110	West.	700
1	100	Allis-Chal.	1150
1	75	West.	750
1	40	G.E.	720

A.C. Generators—220/4000/440/220 v.

No.	KW.	Make	Speed
1	125	West.	257
1	450	Elec. Machy.	120

Pumps With A.C. or D.C. Motors

Qua.	Gpm.	Head	Kind	Make
3	1200	300	Cent.	Worthington
3	1100	323	Cent.	Worthington
3	1000	336	Cent.	Worthington

D.C. Motors—230 volts

No.	H.P.	Make	RPM	Type
1	175	G. E.	550	MD

SAVE OVER 50% ON NEW BLOWERS AND VENTILATING FANS
AXIAL FLOW VENT. FANS
1—4000 cfm 6x3" stat. pres. Sturtevant with 4/1.2 hp., 1750/1150 rpm., 220/3/60 motor.
2—4000 cmf 3" stat. pres. Sturtevant 2 speed AC Motors.
2—5000 cfm 1.8 stat. pres. Sturtevant 220/440 v. AC Motors.
31—6000 cfm Sturtevant Bul. No. 512389, 3" stat. pres., 7 blade dir. con. 5/1.5 hp. 1765/1175 rpm., 220/440 v. AC West. TEFC Motors.
2—6000 cfm Sturtevant 1.65" stat. pres. 220/440 v. AC Motors.
1—7500 cfm Clarage 7½ hp., 220/440 v. 2 speed motor.
2—12000 cfm 3" stat. pres. Sturtevant with dir. con. 10/3 HP. 1775/1180 rpm., 220/440 v. TEFC Motors.

115 VOLT D.C.
8—4000 cfm Sturtevant, 3" stat. pres. West. SK Motors.
4—4000 cfm American Blower, 3" stat. pres. 4/L7 HP. Motors.
1—3000 cfm Sturtevant, 3" stat. pres 3/1.25 HP. Motor.

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CAR PULLERS
100—Brand New with ¼" cable, 1½ and 2 ton A.C. or D.C. Motors.

COMPRESSORS
1—315 CFM Ingersoll Rand Portable, 100 lbs. pres. driven by 105 HP Waukesha Oil Engines, 860 rpm.

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100 KW. Diesel Engine Generator Sets

11—100 KW., 250/275 v. D.C. Delco Generators dir. con. to 150 H.P., Model GBD-8, 5½ x 7, 8 cyl. Superior Diesel Engines, electric starting with muffler, power panel and accessories.

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Haulage and Gathering Locomotives
20 Ton Jeff. and G.E. 500 v. 42" Ga. (Can be rewound 250 v.)
12 Ton West. 250 v. 36 or 44" Ga.
8 Ton Goodman 500 v. 42/44" Ga. (Can be rewound 250 v.)
6 Ton West. 250 v. 904 Motors 36" Ga.

STORAGE BATTERY LOCOMOTIVES
6—7 Ton Jeffrey 42/44" Ga. BB Motors.
6 Ton G.E. perm. 36/44" Ga. HM 825 BB.
5½ Ton Ironton Type A 36/42" Ga.

MINING MACHINES
112 EC3 Flameproof AC 220/3/60 6' bar. Goodman.
112 EJ Goodman 230 v. DC 7½' bar.
35 B Jeffrey Perm. 230 v. 7½' bar.

M-G SETS—ROTARIES (3 ph. 60 cy.)
500 KW 250 v. West.—714 HP Syn. .8 P.F.
450 KW G.E. 250 v.—710 HP. G.E. Syn. 2300 v.
200 KW 250 v G.E. 600 Rotary.
300 KW G.E. Rotary 250 v with 3-110 KVA 2300/4000 v. Transformers.
300 KW 250/125 v. con. 2-150 KW West. SK 125 v. Gen. dir. con. 450 HP Motor.
100 KW West 125-150 HP West. Ind.
75 KW 75 v. West.—100 HP West. Ind.
50 KW 125 v. G.E.—75 HP G.E. 2200 v.
40 KW 250 v. West.—60 HP West. Ind.

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18x24 and 18x30 New Scottdale dbl. roll.

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356 cu. ft. 100 lb. pres. Chic. Pneu. 12x10.
245 cu. ft. 100 lb. pres. Ing. Rd. ER1, 10x10.
175 cu. ft. 100 lb. pres. Chic. Pneu. 9x8.
164 cu. ft. Chic. Pneu. Steam Type.

DC MOTORS

HP	Make	Voltage	Wdg.	Speed
5	Rel.	230	sh.	1750
7½	G.E.	230	sh.	1750
7½	West.	230	cp.	1050
10	West. SK	230	cp.	1150
10	G.E. CD	230	cp.	1750
13	West. SK	230	sh.	875
15	Cr. Wh.	230	sh.	1750
15	West. SK 110	230	cp.	750
20	West. SK	230	sh.	1750
40	G.E. RC	230	sh.	1150
50	West. SK	230	sh.	1750
50	West. S	230	cp.	875
60	Rel. T 461	230	sh.	800/1200
125	West. SK 193	230	sh.	450/1000
200	G.E. RC	550	cp.	875
375	West.	230	cp.	430/860

AC MOTORS (3 ph. 60 cy.)

HP	Make	Wdg.	Spd.	Type
300	G.E.	S.R.	600	IM
300	West.	S.R.	450	IM
300	West.	S.R.	600	CW
150	G.E.	Syn.	600	ATI
125	West.	Syn.	277	——
100	G.E.	S.R.	450	IM
100	Al. Ch.	S.R.	600	——
75	G.E.	S.R.	575	ITC
75	G.E.	S.R.	600	IM
75	West.	S.C.	900	CS
50	Al. Ch.	S.C.	1750	——
50	G.E.	S.R.	900	IM
50	West.	S.R.	600	CW
50	G.E.	S.C.	900	IK
50	G.E.	S.C.	1150	KT
40	G.E.	S.C.	860	KT
35	G.E.	S.C.	1200	IK
25	Cr. Wh.	S.C.	600	——
25	Cr. Wh.	S.C.	860	——
25	Cr. Wh.	S.R.	600	——
15	G.E.	S.C.	1120	KT
15	L. A.	S.C.	3600	——
15	West.	S.C.	1750	W326
10	West.	S.C.	1160	CS
7½	West.	S.C.	1750	CS
5	West.	S.C.	1150	CS

REDUCTION UNITS
500/700 HP Morse Chain Drive. 4.28 to 1.
300 HP V Belt dr. pulleys 30" and 48" supported by 2 roller bgs. with pedestals.
150 HP Nuttall 1.6 to 1.

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W. G. Moore & Son use this Allis-Chalmers HD-19 Diesel Tractor, equipped with a Baker Hydraulic Bulldozer, to work around the dragline in stripping operations near Houtzdale. The HD-19 bunches overburden, cleans the face of the coal, builds drainage ditches and roads. This is the second HD-19 purchased by the Moore Company.

BEFORE you buy any stripping equipment, compare price . . . capacity . . . mobility . . . speed . . . power . . . *PRODUCTION*.

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On the Fiore Coal Co. job, near Pleasant Hill, these A-C tractors with bulldozers move overburden, push back the spoil bank and keep refuse from piling up.

The new Model AD-4 Motor Grader is steadily winning favor among operators. It maintains roads, cuts, cleans and maintains ditches.

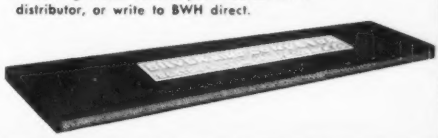
TOUGH LOADS . . . RIGHT ANGLE FEED . . .

LICKED BY BWH CONVEYOR BELT!

Far below ground, a BWH Conveyor Belt, under extremely difficult conditions, licked the problems posed by this Pennsylvania Coal mining operation. Used as a "gathering conveyor," it picked up the discharge from other room conveyors and brought the coal to the cars. This operation involved tandem drive, right angle feed, and uneven distribution of load. Yet this belt . . . produced by the exclusive BWH ROTOCURE process of continuous vulcanization . . . did the job, and did it well!

This "know how" in producing conveyor belts of extraordinary toughness is one reason why BWH is known throughout industry for its achievements in producing industrial rubber goods of dependable ruggedness. Perhaps you've a problem we can solve for you.

HAVE YOU A JOB WHERE STAMINA COUNTS?
Bring us your toughest problems . . . we're specialists in solving them. Consult your nearest BWH distributor, or write to BWH direct.



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Can Bring You . . . 35 Times More Footage Between Bit Changes . . . 25% Faster Drilling

"DRILLS 7,000 FEET OF SLATE, SHALE, AND EARTH BEFORE RE-SHARPENING . . ."

Says West Virginia user

". . . in the same ground steel bits gave us a maximum life of about 200 feet. The Kennametal bit drilled 35 times longer before it was dull and it can be sharpened several more times."

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Reports an Eastern Ohio User of Kennametal Bits

". . . and we get better drilling in hard material . . . for example, a Kennametal Bit, used in hard material, drilled 54 feet in 12 minutes!"

You can drill better and at lower cost with Kennametal "Solid Head" Drill Bits. They drill straight, uniform, single gage holes, stay sharp longer, and drill up to 20% more footage per shift. Because of this, both operating and bit costs are reduced, and drillers are relieved of the burden of repeatedly pulling and re-installing sectional augers.

The cutting edges of Kennametal Bits — **hard, durable Kennametal** — resist shock, abrasion and wear, far better than any other tool material. The prongs are angled to "bite" into tough, non-uniform materials, take hard shock, and move the material freely on to the auger.

Kennametal "Solid Head" Bits are available in sizes from 3¾" to 9". Write today for Catalog M-5 which gives full particulars on this and other Kennametal cutting and drilling tools.

KENNAMETAL®

Mining Division · Kennametal Inc., Latrobe, Pa.

World's Largest Manufacturer of Cemented Carbide Mining Tools

THESE KENNAMETAL TOOLS ARE REDUCING MINING COSTS —INCREASING OUTPUT

KENNAMETAL Two-Prong Drill Bits
for post, mounted, and push drills in sizes 1⅜", 1½", 1⅝" 1¾", 1⅞", 2", 2¼", 3¼".

KENNAMETAL Mining Machine Bits
for chains that accomodate conventional ½" x 1" bits.

KENNAMETAL Rock Bits
in sizes of 1⅜", 1½", 1⅝", 1¾", 2", 2¼", 2½", 3".

KENNAMETAL Finger Bits
for conventional drill heads.